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Principal products, except when cyanoguanidine is employed, are usually dominated by cis- and trans-N_2F_2 and N_2F_4. The usually dominant subgaseous product is NF_3. Proportions of these products may vary as indicated in the appended Examples, and may vary in consistent and predictable ways with the starting material employed. For example, sodium azide may produce NF_3 and N_2F_2 and substantially no N_2F_4, while sodium amide may produce NF_3 and N_2F_4 and substantially no N_2F_2. These products are readily recoverable from the reaction effluent by conventional low temperature condensation and fractional distillation. Reactor residues are potentially mixtures of various fluorides. NF_3 is of known utility, for example as an intermediate for reaction with nitric oxide to make tetrafluorohydrazine, N_2F_4, a common and commercially available material. N_2F_4 is also useful as a catalyst for the polymerization of monomers such as methyl methacrylate, styrene and cyclopentadiene.

The principles of the invention as described above may be used to advantage to fluorinate cyanoguanidine, ##EQU1## and thereby effect high yield production of perfluoromethylamine (CF_3NF_2). Also formed is N_2 and CF_4, a known compound which is a gas at normal conditions. In this embodiment, reaction temperatures may be substantially the same as those described above, preferably between 15 DEG C. and 150 DEG C. Otherwise all of the above operational techniques and procedural factors, such as compositions of catalysts, proportioning of the cyanoguanidine and catalyst, rate of feed of fluorine and dilution of the gases, and recovery of CF_3NF_2 likewise apply in practice of this embodiment of the invention.

EXAMPLE 1

About 1 g of lithium amide was placed in a 1 liter Monel reactor vessel. The vessel, in about a 30 weight percent solution of sodium hydroxide in water, was cooled to 0 DEG C. The reactor was a 12 inch long, 1 inch O.D. tube, with a wall thickness about 0.065 inch. Fluorine was provided through a 1/4 inch O.D. Monel tube. Nitrogen was provided through a 1/4 inch O.D. Monel tube. Fluorine and nitrogen were each metered at a flow rate of approximately 20 to 30 cc/min. The fluorine and nitrogen were mixed in a 1/4 inch O.D. Monel tee and passed into the reactor vessel through a 1/4 inch O.D. Monel tube. The fluorine and nitrogen were passed through the reactor vessel for about 1 hour. The reactor effluent was passed through a 1/4 inch O.D. Monel tube into a 1 liter Monel vessel cooled to -196 DEG C. with liquid nitrogen. The reactor effluent was then passed through a 1/4 inch O.D. Monel tube into a 1 liter Monel vessel cooled to -196 DEG C. with liquid nitrogen. The reactor effluent was then passed through a 1/4 inch O.D. Monel tube into a 1 liter Monel vessel cooled to -196 DEG C. with liquid nitrogen.

bath. About 15-30 min. later, intensities of the infrared spectrum [illegible] diffluorodiazine greatly increased. From the infrared spectrum it was determined that [illegible] 18 mmHg of diffluorodiazine and about 15 mmHg of NF_3 were present in the reactor exit.

EXAMPLE 4

[illegible] fluoride, $NaNF_2$, were mixed and charged into the reactor. [illegible] fluorine gas flow rate was adjusted to about [illegible] and after nitrogen dilution of about [illegible] the fluorine-nitrogen mixture was charged into the reactor. Throughout the run reactor temperature was maintained at about 25 DEG C. As determined by infrared analysis of the reactor exit gas, immediately on introduction of fluorine into the reactor, nitrogen trifluoride [illegible] and within about 60 minutes a yield of about 5 mmHg of NF_3 was obtained as determined by infrared analysis of the reactor off-gas. After reaction time of about 2 hours, reactor off gas contained about 10 mmHg of NF_3 and 20 mmHg of N_2F_2. The gaseous impurities included small amounts of N_2, CF_4, N_2F_4 and NOF.

EXAMPLE 2

[illegible] and charged into the reactor of Example 1. Scrubbed fluorine gas flow rate was adjusted to about 20 [illegible] and after nitrogen dilution of about [illegible] the fluorine-nitrogen mixture was charged into the reactor. Throughout the run, reactor temperature was maintained at about 25 DEG C. Within half an hour after charging of fluorine, NF_3 and N_2F_2 were [illegible] determined by infrared analysis of the reactor off-gas and [illegible] about [illegible] N_2F_2 and N_2F_4 increased rapidly. Then N_2F_4 was observed and masked the infrared bands of N_2F_2. At about 105 min. after start up infrared bands of N_2F_4 became so strong that the absorbance became infinite. Infrared analysis of about a 50% [illegible] fraction of the product gas showed presence of about 20 mmHg of NF_3 and 40 mmHg of [illegible] operation at [illegible] reaction temperature was raised to about [illegible] DEG C. At the end of the run, infrared analysis of the off gas of the reactor showed the presence mixture of about 260 mmHg of NF_3 and about 200 mmHg of N_2F_4.

[illegible]

About [illegible] mixture was introduced into the reactor of the previous Example. Scrubbed fluorine gas flow rate was adjusted to about [illegible] and after nitrogen dilution of about [illegible] the fluorine-nitrogen [illegible] of the reactor was [illegible] was formed. Further infrared analysis of the reactor off-gas [illegible] minute longer young of the reactor were obtained, and in about [illegible] mmHg of N_2F_4 and [illegible] mmHg of NF_3, and in 2 hours [illegible]

[illegible]

[illegible] temperatures in the reaction zone substantially [illegible] but not above the phase change temperature of the starting material if a liquid or not above the decomposition temperature of the starting material if a solid, and [illegible] from the reaction zone [illegible] gases containing nitrogen trifluoride.

[illegible] containing nitrogen trifluoride.

[illegible] The process of claim [illegible] in which the fluoride catalyst introduced into the reaction zone is an alkali metal fluoride.

[illegible] alkali metal [illegible] group consisting of [illegible]

5. The process for cleaving substituted ammonia compounds [illegible] hydrogen atoms selected from the group consisting of alkali metal [illegible] hydrazine [illegible] which comprises in combination the steps of: a) introducing into a reaction zone one of the afore-mentioned substituted ammonia compounds as starting material and a fluoride catalyst, said fluoride catalyst being a fluoride of a metal which forms an acid salt with hydrogen fluoride, b) subjecting said starting material to the action of elemental fluorine while in the presence of said catalyst, c) maintaining temperatures in the reaction zone substantially in the range of [illegible] DEG C. but not above the phase change temperature of the starting material if a liquid or not above the decomposition temperature of the starting material if a solid, to effect cleavage of the starting material and fluorination of the cleavage products, and d) collecting from the reaction zone the volatile off gases containing nitrogen trifluoride.

6. The process of claim 5 in which the metal fluoride catalyst introduced into the reaction zone is an alkali metal fluoride.

7. The process of claim 5 in which the metal fluoride catalyst introduced into the reaction zone is a bifluoride.

8. The process of claim 5 in which the metal fluoride [illegible] fluoride of an alkali metal of the group consisting of lithium and sodium.

[illegible] the metal fluoride catalyst is a bifluoride of an alkali metal of [illegible] the temperatures in the reaction zone are maintained [illegible] 200 DEG C. and [illegible] the fluorine is [illegible] diluted [illegible] volume of inert gas.

10. The process of claim [illegible] in which the starting material is [illegible]

11. The process of claim [illegible] in which the starting material is urea.

[illegible]

[illegible] The process of claim [illegible] in which the starting material is [illegible]

[illegible] The process of claim [illegible] in which the starting material is [illegible]

[illegible]